

REMARKS/ARGUMENTS

Claims 16-23 are pending in the application. Claim 1 is canceled by the foregoing amendments. Claims 16 and 21 have been amended to more clearly indicate relationship of the elements of those claims. Applicants now address the previous rejection of these claims in the Final Office action mailed on July 2, 2003 in the parent application of the present application.

Claim Rejections - 35 U.S.C. § 103

The Examiner has rejected claims 16-23 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,501, 746 to Leung. This rejection is respectfully reversed.

Claim 16 recites:

In a communication system for communicating with a plurality of mobile nodes, the system managing Internet Protocol (IP) addresses in multiple address pools, **the multiple pools having overlapping IP addresses** and each pool being associated with a unique home agent IP address, a method comprising:

assigning a home IP address to a given mobile node from one of the multiple pools; and,

in a mobility agent, **using a combination of the assigned home IP address of the given mobile node and an IP address of a home agent** to uniquely identify the given mobile node.

The Examiner asserts that Leung discloses a method and system for communicating with a plurality of mobile nodes, the system managing Internet Protocol (IP) addresses in multiple address pools, **the multiple pools having overlapping IP addresses**. Applicants respectfully disagree with this assertion by the Examiner. While Leung describes assigning IP addresses from a pool, Leung contains no teaching, suggestion or disclosure of a system and method where IP addresses are assigned from multiple pools having **overlapping IP addresses**. For example, Leung states in his SUMMARY at column 3, lines 36-41:

The present invention may be used to temporarily assign an IP address to a mobile node on an as-needed basis. In this manner, a pool of IP addresses may be advantageously distributed to preserve the pool of IP addresses. Accordingly, the

present invention permits an entity to economically utilize a limited number of IP addresses.

While Leung describes assigning IP addresses from a pool, it contains no teaching that the IP addresses in the pool are overlapping. This is particularly relevant, because if overlapping addresses were employed in the address pool of the system and method of Leung, that system and method would potentially not function as two mobile nodes could be assigned the same IP (overlapping) address, which would result in packet routing errors due to the presence of identical IP addresses on the Internet with no mechanism for distinguishing between such mobile nodes.

The Examiner further asserts that Leung discloses using a combination of an assigned Home IP Address of the given mobile node and an IP address of a Home Agent to uniquely identify the given mobile node in a mobility agent. Applicants also respectfully disagree with this assertion of the Examiner. In this regard, the Examiner relies on Leung column 9, lines 42-62, which recites:

FIG. 4 is a diagram illustrating a registration reply having a Home Address ID extension that may be sent by a Home Agent in accordance with an embodiment of the invention. As shown, the fixed length portion 402 of the registration reply includes a Type field 404 that identifies the message as either a Registration Request (1) or a Registration Reply (3). In addition, a Code field 406 tells the mobile node whether its attempted registration was accepted or rejected. A Lifetime field 408 in the registration reply tells the mobile node how long the registration lasts before it expires. In addition, **the registration reply includes the mobile node's Home Address 410 and the Home Agent Address 412.** The Identification field 414 is chosen by the mobile node to be unique for each registration. This allows the mobile node to match Registration Requests with the corresponding Registration Replies. In addition, this may be used to prevent a third party from capturing the registration request and replaying it at a later time. As described above, the registration reply may include a Home Address ID extension 416 which is capable of storing the IP address, or Home Address 418, that is assigned to the mobile node during registration. (*Emphasis supplied*)

The Examiner appears to be relying on the statement in Leung that a registration reply includes a Home Address 410 and a Home Agent Address 412 to teach the aspect of claim 1 that a

combination of an assigned home IP address of the given mobile node and an IP address of a Home Agent to uniquely identify the given mobile node in a mobility agent. What Leung is in fact stating is part of the Mobile IP standard, IP Mobility Support, RFC 2002, The Internet Engineer Task Force, October 1996. For the Examiner's convenience, relevant portions of this standard are attached as Exhibit A. As may be seen in section 3.4 of the RFC 2002, the User Datagram Protocol (UDP) header for a registration supply includes, among other things, a Home Address and a Home Agent Address. The registration reply, however, is merely a response to the registration request from a mobile node and the UDP header of the registration reply is not used to uniquely identify the given mobile node in a mobility agent, contrary to the Examiner's request.

Also consistent with the RFC 2002, Leung uses a Mobile Host Table to identify data session (e.g., a point-to-point protocol session) associated with a particular mobile node. Such a Mobile Host Table 702 is illustrated in Fig. 7 of Leung, which is included below for the Examiner's convenience.

Mobile Host Table	
MN-ID1	IP Address1/Home Address1
MN-ID2	IP Address2/Home Address2
⋮	⋮
MN-IDX	IP AddressX/Home AddressX

FIG. 7

Leung describes this table in column 10, line 58 through column 11, line 5, which recites:

FIG. 7 is a diagram illustrating an exemplary mobile host table that may be used by an active Home Agent in accordance with an embodiment of the invention. As

shown, the mobile host table 702 provides a list of mobile nodes that the Home Agent supports such that each of the mobile nodes is associated with a corresponding IP address when actively roaming. The mobile host table 702, as shown, includes an entry 704 for one or more mobile nodes that are supported by the Home Agent. Each of these entries 704 includes **a mobile node ID 706 associated with one of the mobile nodes. Such an association may be accomplished by including an IP address 708 associated with the mobile node. By way of example, the IP address 708 may be a configured Home Address or an IP address allocated from the pool of IP addresses.** (*Emphasis supplied*)

As may be seen from this portion of Leung, a mobile node with a mobile ID 706 is identified in the Mobile Host Table 702 by including an IP Address in the Table 702. The IP address may be a configured Home address or an IP Address allocated from the pool (non-overlapping, as discussed above) of IP address. This approach is completely consistent with section 4.2.2 RFC 2002, which describes using a Home Address (inner destination address) to identify a mobile node in a visitor list (such as Leung's Mobile Host Table 702), but not does not describe using the Home Agent Address in conjunction with the Home Address. Thus, Leung does not teach, suggest or described identifying a mobile node with **an assigned home IP address of the given mobile node and an IP address of a Home Agent to uniquely identify the given mobile node,** as is recited in claim 16.

Because Leung fails to teach suggest or describe using the combination of a Home Address and a Home Agent Address to uniquely identify a mobile node and the use of multiple address pools having overlapping addresses, it does not render claim 16 obvious. Therefore, the previous rejection of claim 1 is overcome and that claim is allowable.

Claims 17-23 depend ultimately from claim 16 and include all the limitations of claim 16 and any intervening claims. Therefore, claims 17-23 are allowable on at least the same basis as claim 16. Thus, claims 17-23 are also allowable.

Conclusion

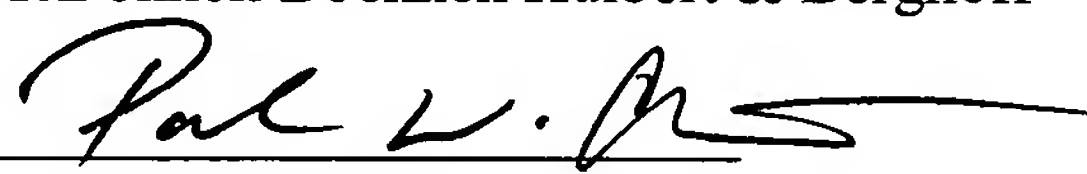
In view of the foregoing, all of the claims, as amended, pending in this patent application are in condition for allowance. If the Examiner has any questions, he is invited to contact the undersigned at (360) 379-6514. An early allowance of all the claims is respectfully requested.

Respectfully Submitted,

McDonnell Boehnen Hulbert & Berghoff


Date: Jan. 13, 2004

By:


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CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8

The undersigned hereby certifies that the foregoing SUPPLEMENTAL PRELIMINARY AMENDMENT with attached Exhibit A is being deposited as first class mail, postage prepaid, in an envelope addressed to Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 13th day of January 2004.


Paul W. Churilla



3.4. Registration Reply

A mobility agent returns a Registration Reply message to a mobile node which has sent a Registration Request (Section 3.3) message. If the mobile node is requesting service from a foreign agent, that foreign agent will receive the Reply from the home agent and subsequently relay it to the mobile node. The Reply message contains the necessary codes to inform the mobile node about the status of its Request, along with the lifetime granted by the home agent, which MAY be smaller than the original Request.

The foreign agent MUST NOT increase the Lifetime selected by the mobile node in the Registration Request, since the Lifetime is covered by the Mobile-Home Authentication Extension, which cannot be correctly (re)computed by the foreign agent. The home agent MUST NOT increase the Lifetime selected by the mobile node in the Registration Request, since doing so could increase it beyond the maximum Registration Lifetime allowed by the foreign agent. If the Lifetime received in the Registration Reply is greater than that in the Registration Request, the Lifetime in the Request MUST be used. When the Lifetime received in the Registration Reply is less than that in the Registration Request, the Lifetime in the Reply MUST be used.

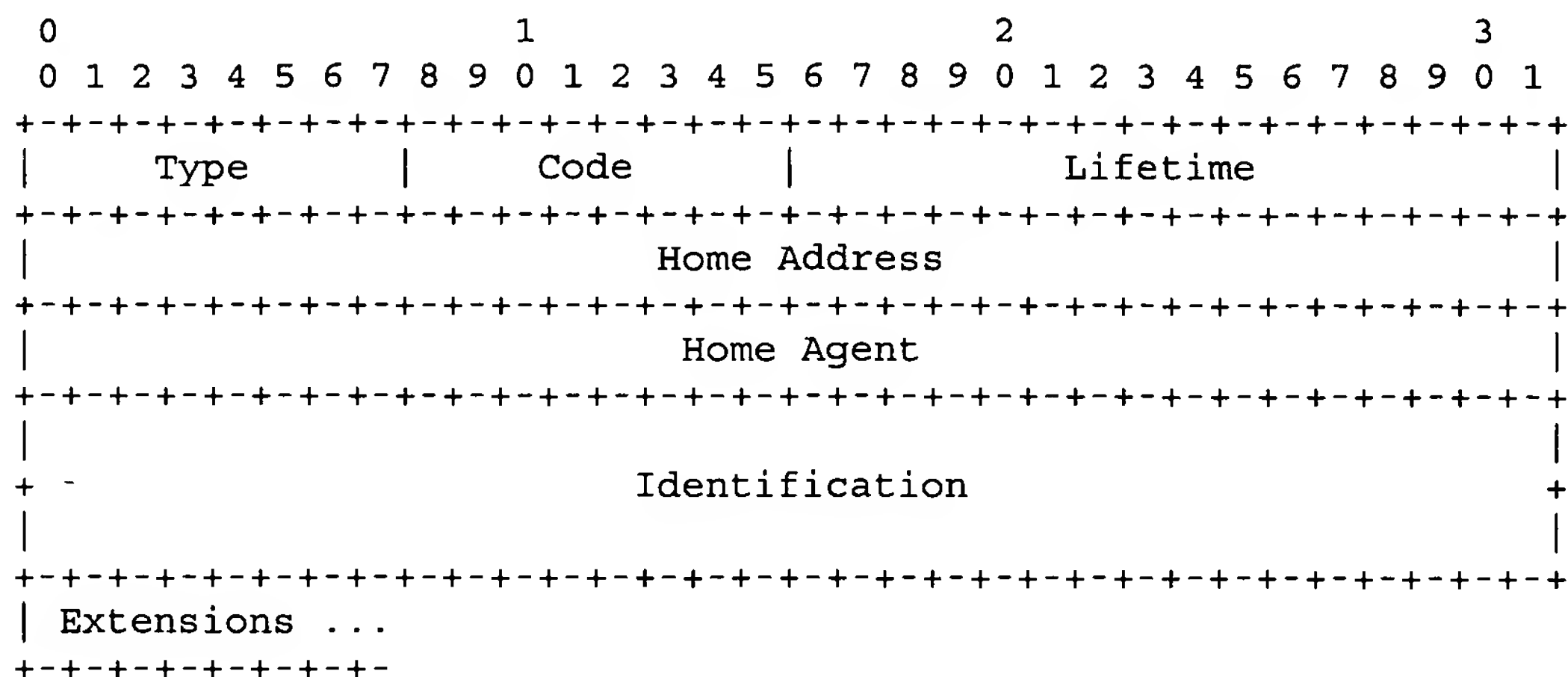
IP fields:

Source Address	Typically copied from the destination address of the Registration Request to which the agent is replying. See Sections 3.7.2.3 and 3.8.3.1 for complete details.
Destination Address	Copied from the source address of the Registration Request to which the agent is replying

UDP fields:

Source Port	<variable>
Destination Port	Copied from the source port of the corresponding Registration Request (Section 3.7.1).

The UDP header is followed by the Mobile IP fields shown below:



Type 3 (Registration Reply)

Code A value indicating the result of the Registration Request. See below for a list of currently defined Code values.

Lifetime

If the Code field indicates that the registration was accepted, the Lifetime field is set to the number of seconds remaining before the registration is considered expired. A value of zero indicates that the mobile node has been deregistered. A value of 0xffff indicates infinity. If the Code field indicates that the registration was denied, the contents of the Lifetime field are unspecified and MUST be ignored on reception.

Home Address

The IP address of the mobile node.

Home Agent

The IP address of the mobile node's home agent.

Identification

A 64-bit number used for matching Registration Requests with Registration Replies, and for protecting against replay attacks of registration messages. The value is based on the Identification field from the Registration Request message from the mobile node, and on the style of replay protection used in the security context between the mobile node and its home agent (defined by the mobility security association between them, and SPI value in the Mobile-Home Authentication Extension). See Sections 5.4 and 5.6.

Extensions

The fixed portion of the Registration Reply is followed by one or more of the Extensions listed in Section 3.5. The Mobile-Home Authentication Extension **MUST** be included in all Registration Replies returned by the home agent. See Sections 3.7.2.2 and 3.8.3.3 for rules on placement of extensions to Reply messages.

The following values are defined for use within the Code field.
Registration successful:

- 0 registration accepted
- 1 registration accepted, but simultaneous mobility bindings unsupported

Registration denied by the foreign agent:

- 64 reason unspecified
- 65 administratively prohibited
- 66 insufficient resources
- 67 mobile node failed authentication
- 68 home agent failed authentication
- 69 requested Lifetime too long
- 70 poorly formed Request
- 71 poorly formed Reply
- 72 requested encapsulation unavailable
- 73 requested Van Jacobson compression unavailable
- 80 home network unreachable (ICMP error received)
- 81 home agent host unreachable (ICMP error received)
- 82 home agent port unreachable (ICMP error received)
- 88 home agent unreachable (other ICMP error received)

Registration denied by the home agent:

- 128 reason unspecified
- 129 administratively prohibited
- 130 insufficient resources
- 131 mobile node failed authentication
- 132 foreign agent failed authentication
- 133 registration Identification mismatch
- 134 poorly formed Request
- 135 too many simultaneous mobility bindings
- 136 unknown home agent address

Up-to-date values of the Code field are specified in the most recent "Assigned Numbers" [20].

3.7.3. Receiving Registration Replies

The foreign agent updates its visitor list when it receives a valid Registration Reply from a home agent. It then relays the Registration Reply to the mobile node. The following sections describe this behavior in more detail.

If upon relaying a Registration Request to a home agent, the foreign agent receives an ICMP error message instead of a Registration Reply, then the foreign agent SHOULD send to the mobile node a Registration Reply with an appropriate "Home Agent Unreachable" failure Code (within the range 80-95, inclusive). See Section 3.7.2.3 for details on building the Registration Reply.

3.7.3.1. Validity Checks

Registration Replies with an invalid, non-zero UDP checksum MUST be silently discarded.

When a foreign agent receives a Registration Reply message, it MUST search its visitor list for a pending Registration Request with the same mobile node home address as indicated in the Reply. If no pending Request is found, the foreign agent MUST silently discard the Reply. The foreign agent MUST also silently discard the Reply if the low-order 32 bits of the Identification field in the Reply do not match those in the Request.

Also, the authentication in the Registration Reply MUST be checked. If the foreign agent and the home agent share a mobility security association, exactly one Foreign-Home Authentication Extension MUST be present in the Registration Reply, and the foreign agent MUST check the Authenticator value in the Extension. If no Foreign-Home Authentication Extension is found, or if more than one Foreign-Home Authentication Extension is found, or if the Authenticator is invalid, the foreign agent MUST silently discard the Reply and SHOULD

log the event as a security exception. The foreign agent also MUST reject the mobile node's registration and SHOULD send a Registration Reply to the mobile node with Code 68.

3.7.3.2. Forwarding Replies to the Mobile Node

A Registration Reply which satisfies the validity checks of Section 3.8.2.1 is relayed to the mobile node. The foreign agent MUST also update its visitor list entry for the mobile node to reflect the results of the Registration Request, as indicated by the Code field in the Reply. If the Code indicates that the mobile node has accepted the registration and the Lifetime field is nonzero, the foreign agent MUST set the Lifetime in the visitor list entry to the value specified in the Lifetime field of the Registration Reply. If, instead, the Code indicates that the Lifetime field is zero, the foreign agent MUST delete its visitor list entry for the mobile node. Finally, if the Code indicates that the registration was denied by the home agent, the foreign agent MUST delete its pending registration list entry, but not its visitor list entry, for the mobile node.

The foreign agent MUST NOT modify any of the fields beginning with the fixed portion of the Registration Reply up through and including the Mobile-Home Authentication Extension. Otherwise, an authentication failure is very likely to occur at the mobile node. In addition, the foreign agent SHOULD perform the following additional procedures:

- It MUST process and remove any Extensions following the Mobile-Home Authentication Extension,
- It MAY append its own non-authentication Extensions of relevance to the mobile node, if applicable, and
- It MUST append the Mobile-Foreign Authentication Extension, if the foreign agent shares a mobility security association with the mobile node.

Specific fields within the IP header and the UDP header of the relayed Registration Reply are set according to the same rules specified in Section 3.7.2.3.

After forwarding a valid Registration Reply to the mobile node, the foreign agent MUST update its visitor list entry for this registration as follows. If the Registration Reply indicates that the registration was accepted by the home agent, the foreign agent resets its timer of the lifetime of the registration to the Lifetime granted in the Registration Reply; unlike the mobile node's timing of the registration lifetime as described in Section 3.6.2.2, the foreign agent considers this lifetime to begin when it forwards the

Registration Reply message, ensuring that the foreign agent will not expire the registration before the mobile node does. On the other hand, if the Registration Reply indicates that the registration was rejected by the home agent, the foreign agent deletes its visitor list entry for this attempted registration.

4.2.2. Foreign Agent Considerations

Upon receipt of an encapsulated datagram sent to its advertised care-of address, a foreign agent MUST compare the inner destination address to those entries in its visitor list. When the destination does not match the address of any mobile node currently in the visitor list, the foreign agent MUST NOT forward the datagram without modifications to the original IP header, because otherwise a routing loop is likely to result. The datagram SHOULD be silently discarded. ICMP Destination Unreachable MUST NOT be sent when a foreign agent is unable to forward an incoming tunneled datagram. Otherwise, the foreign agent forwards the decapsulated datagram to the mobile node.

The foreign agent MUST NOT advertise to other routers in its routing domain, nor to any other mobile node, the presence of a mobile router (Section 4.5).

The foreign agent MUST route datagrams it receives from registered mobile nodes. At a minimum, this means that the foreign agent must verify the IP Header Checksum, decrement the IP Time To Live, recompute the IP Header Checksum, and forward such datagrams to a default router. In addition, the foreign agent SHOULD send an appropriate ICMP Redirect message to the mobile node.